

## ABSTRACT OF THE DISCLOSURE

A solid-state energy converter with a semiconductor or semiconductor-metal implementation is provided for conversion of thermal energy to electric energy, or electric energy to refrigeration. In  $n$ -type heat-to-electricity embodiments, a highly doped  $n^*$  emitter region made of a metal or semiconductor injects carriers into an  $n$ -type gap region. A  $p$ -type layer is positioned between the emitter region and gap region, allowing for discontinuity of corresponding Fermi-levels and forming a potential barrier to sort electrons by energy. Additional  $p$ -type layers can optionally be formed on the collector side of the converter. One type of these layers with higher carrier concentration ( $p^*$ ) serves as a blocking layer at the cold side of the converter, and another layer ( $p^{**}$ ) with carrier concentration close to the gap reduces a thermoelectric back flow component. Ohmic contacts on both sides of the device close the electrical circuit through an external load to convert heat to electricity. In the case of a refrigerator, the external load is substituted by an external power supply.

W:\13693\22.1\VF0000003168V001.doc

WORKMAN NYDEGGER  
A PROFESSIONAL CORPORATION  
ATTORNEYS AT LAW  
1000 EAGLE GATE TOWER  
60 EAST SOUTH TEMPLE  
SALT LAKE CITY, UTAH 84111